

Mid-Term Report Presentation

Single Axis Solar Tracker

For Prama Instruments Pvt Ltd

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PS Instructor

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Industry Mentor

Chittaranjan Sir

Kalpesh Patel Sir

Prama Instruments Pvt Ltd

Solar Tracker



- A Solar tracker is a device used for orienting solar photovoltaic panel or lens towards the sun by using the solar or light sensors connected with the machine like linear actuator.
- Hence, the sun tracking systems can collect more energy than what a fixed panel systems collects.

Types of Solar Trackers

The sun's position in the sky varies both with the seasons (elevation) and time of the day as the sun moves across the sky. Hence there are two types of Solar Tracker:

Single Axis Solar Tracker:

Single Axis Solar Trackers can either have a horizontal or a vertical axle.

They are mostly built for tracking the sun from east to west direction.

Dual Axis Solar Tracker:

Double axis solar trackers have both a horizontal and vertical axle and so can track the sun's motion exactly anywhere in the world.

Single Axis Solar Tracker

- Single axis trackers are a technology that adjusts the position of a solar panel along an axis to follow the sun's changing position throughout the passing days and years.
- The panel is adjusted to create the smallest angle of incidence (angle at which the sun hits a solar panel).
- The trackers tilt on a singular axis to follow the sun from east to west as it moves throughout the course of each day in order to maximize energy production.

Single Axis Solar Tracker

Our Vision for the Project



Make the Solar Tracker Package
as inexpensive as possible.



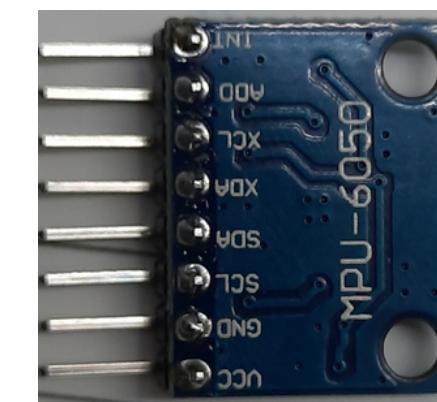
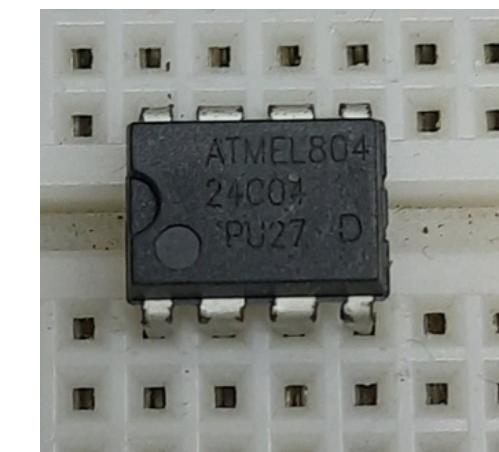
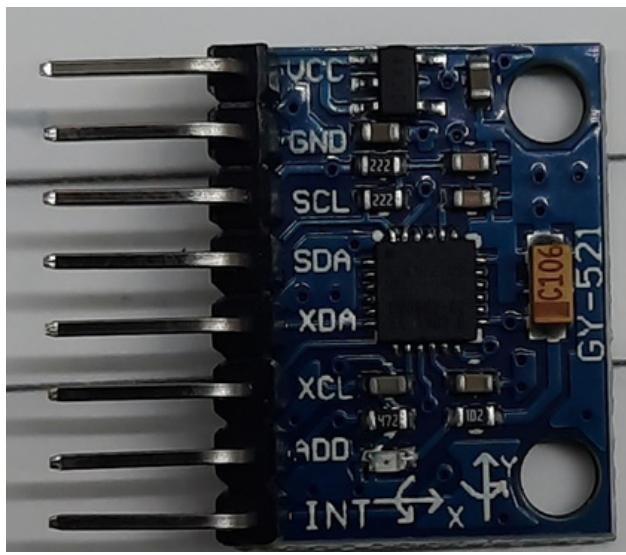
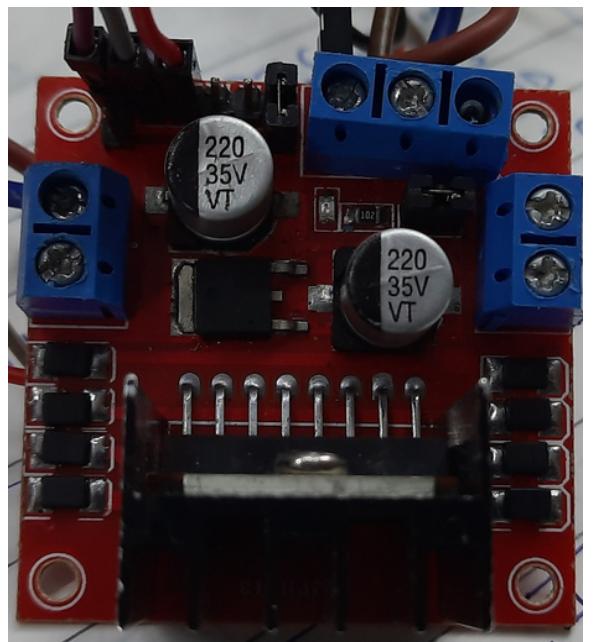
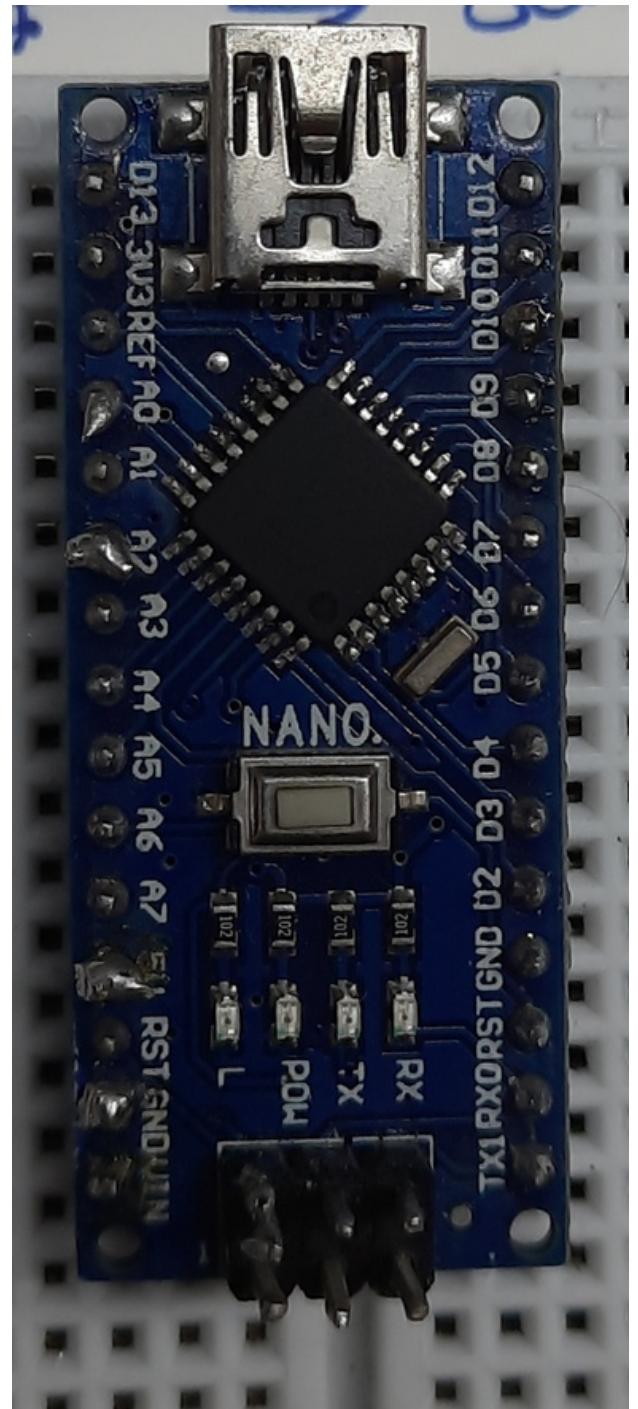
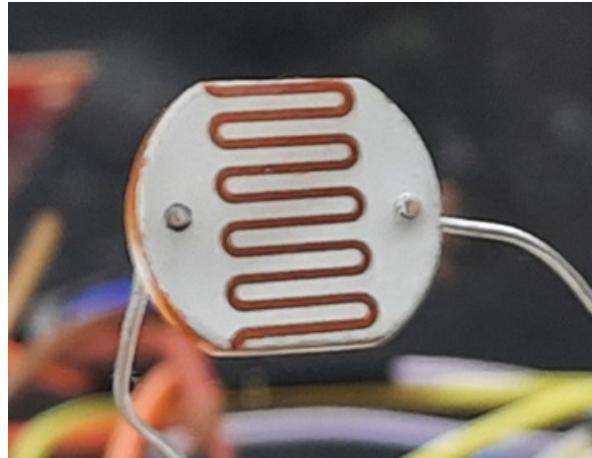
Make it easy to install for a
layman installing a Solar Panel.



Increase the efficiency of the
Solar Panel in terms of
Power generated.



Make it a way of being more
sustainable and more efficient
way of Electricity generation.

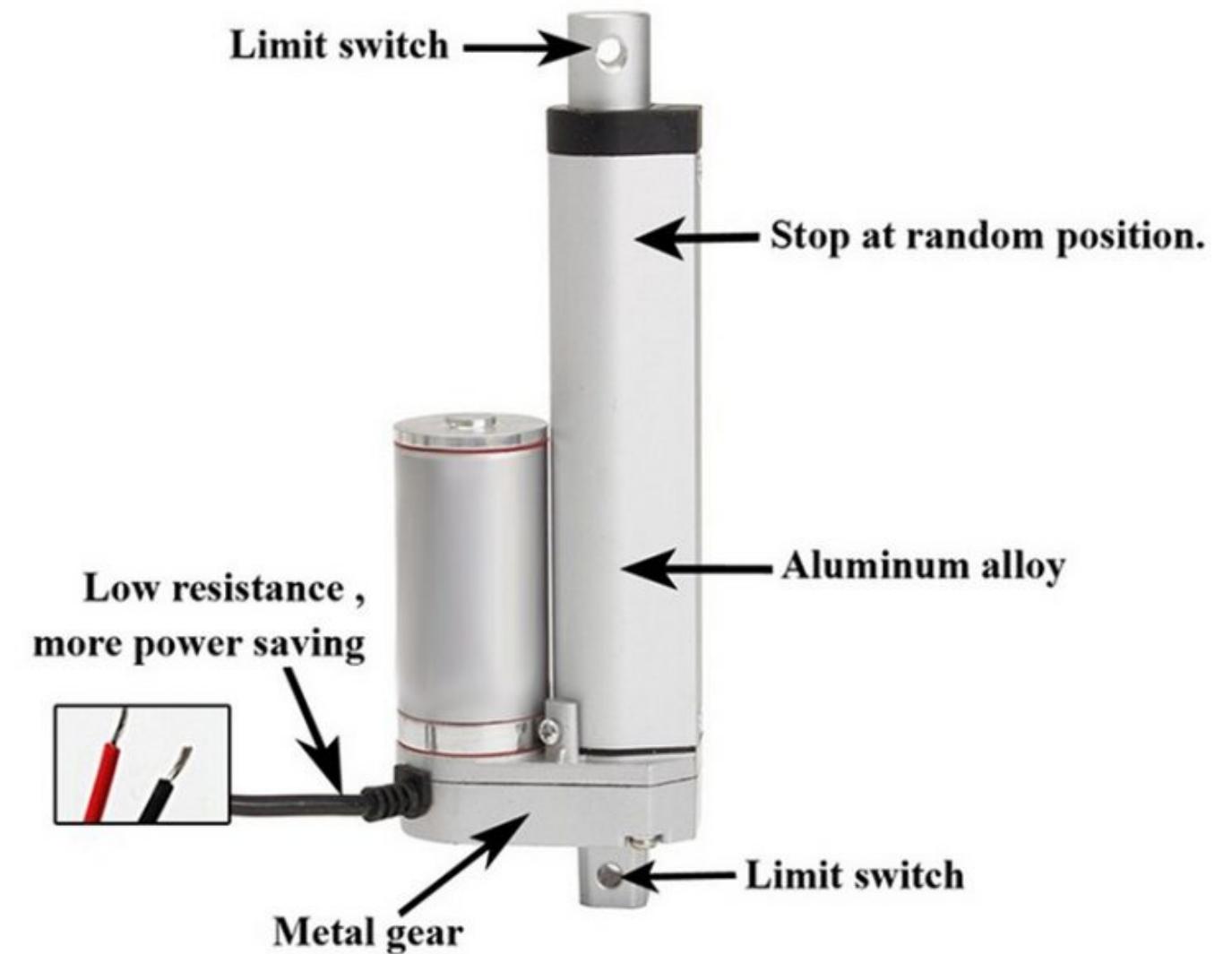


Components Used

Linear Actuator

To change the angle at which the Solar Panel faces the Sun.

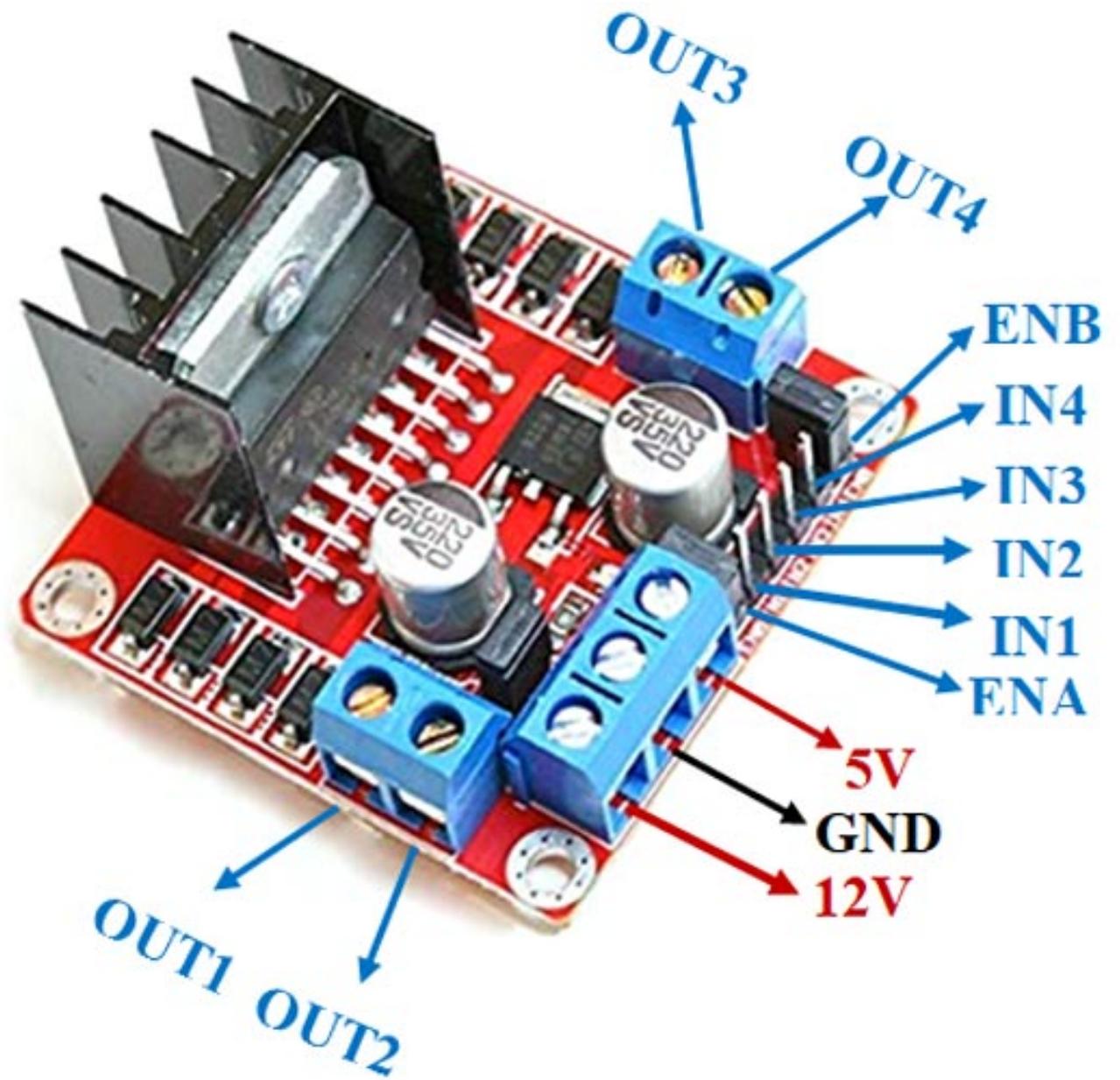
This electric push rod is a kind of electric driving device which transforms the rotary motion of the motor into the linear reciprocating motion of the pushrod.



Motor Driver L298N

To control the movement of Linear Actuator.

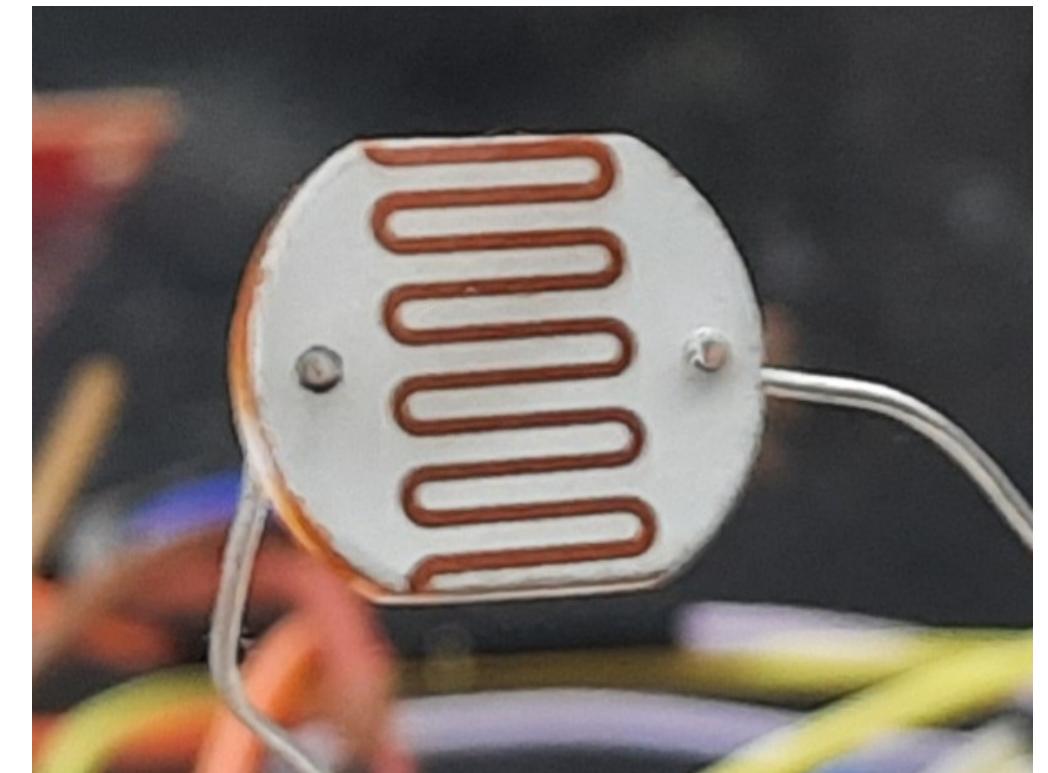
L298N 2A Based Motor Driver is a high power motor driver perfect for driving DC Motors and Stepper Motors .



Light Dependent Resistor

To find the intensity of sunlight falling on the Solar Panel.

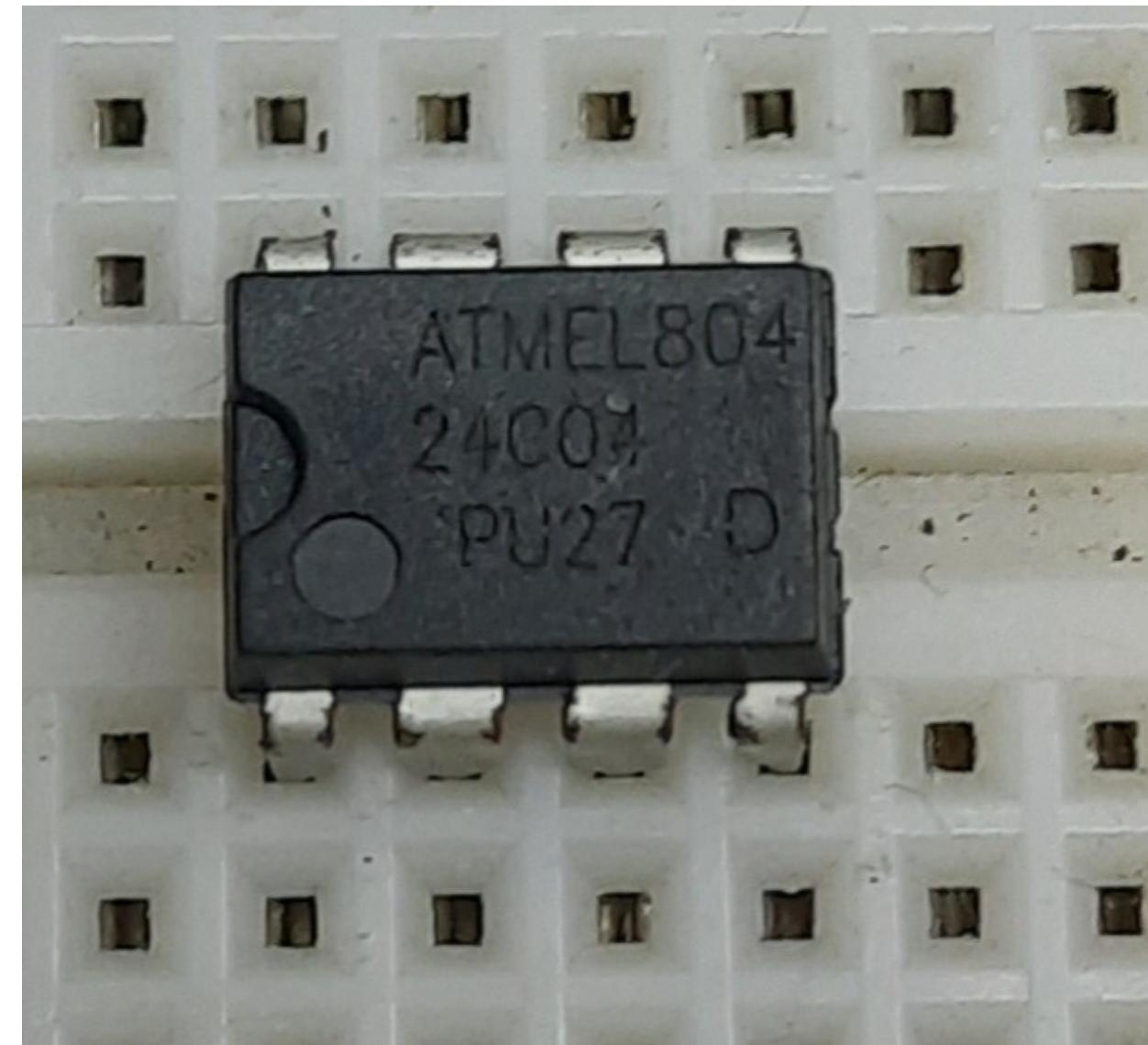
The resistance of 20mm GL20528 Light Sensitive Photoresistor LDR changes with the change in the ambient light exposed on the surface of the sensor. As the light on the sensor increases then the resistance across the two leads decreases.



24C04 EEPROM

To save data from Arduino and keep the data safe even when switch is off.

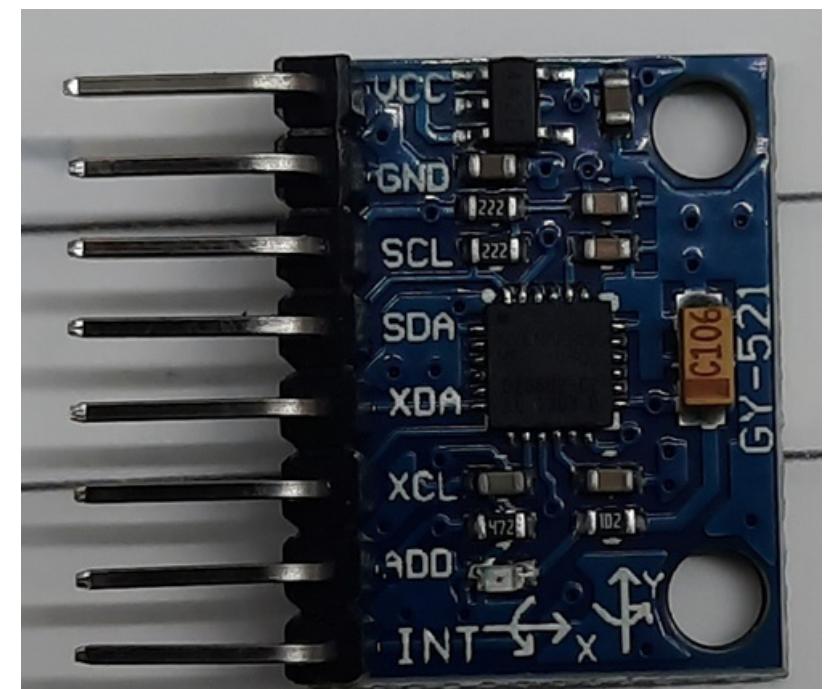
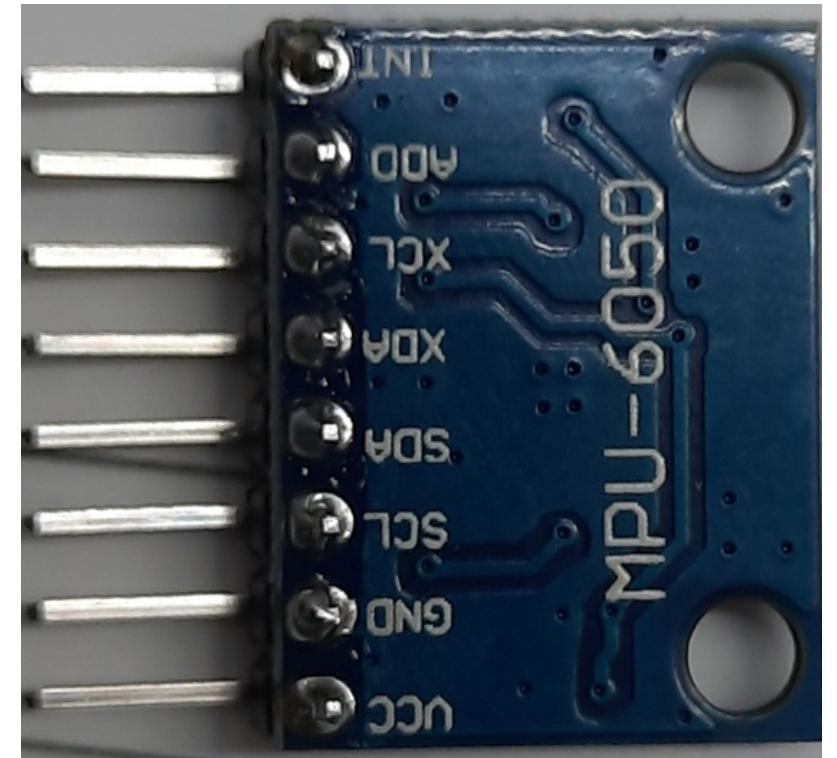
If you need to do some data storage in Arduino, then using the EEPROM is probably the most simple practices.



MPU-6050 3-Axis Accelerometer and Gyro Sensor

To measure the inclination of the panel with respect to the horizontal plane.

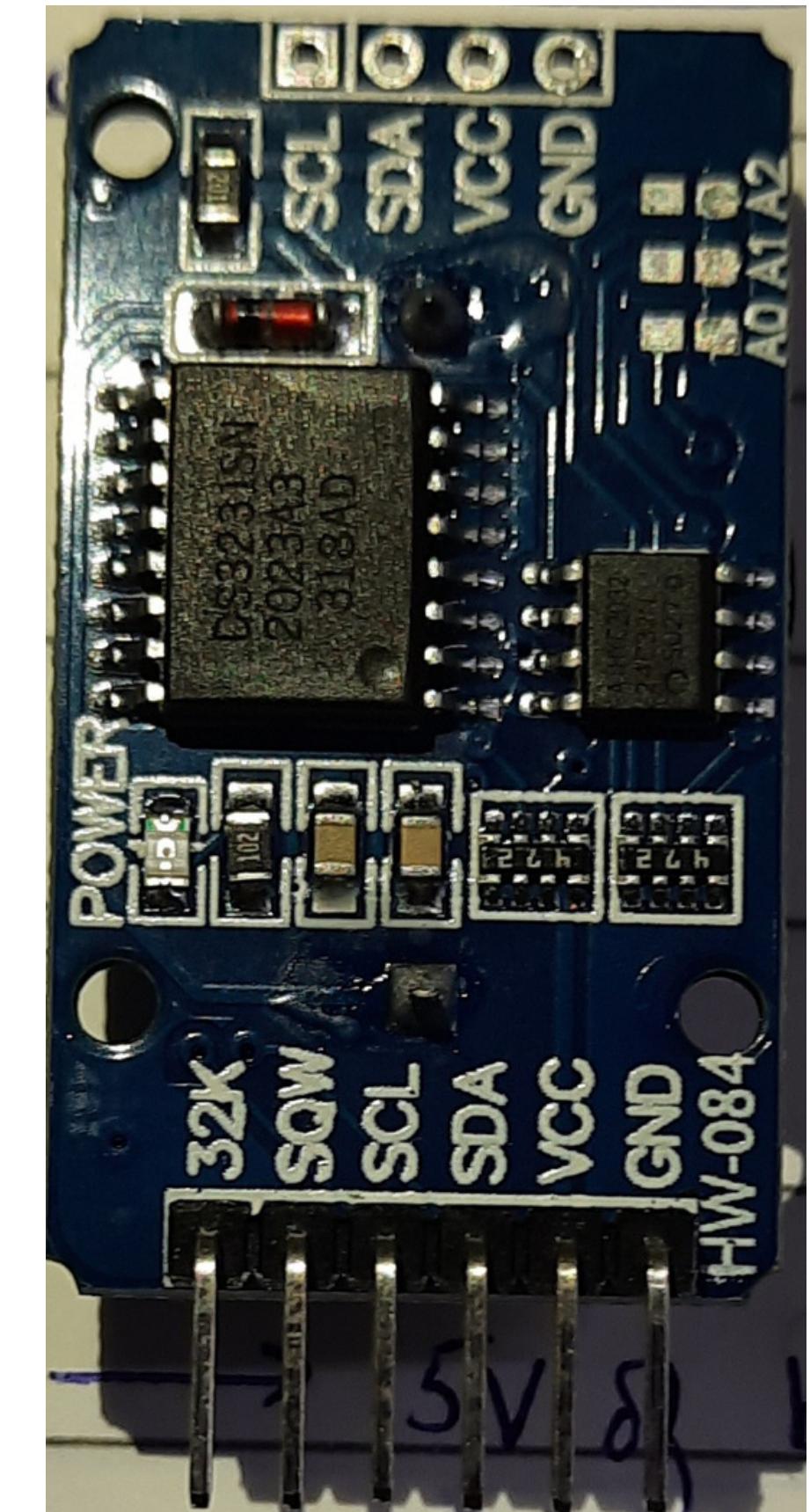
The MPU6050 devices combine a 3-axis gyroscope and a 3-axis accelerometer on the same silicon together with an onboard Digital Motion Processor (DMP) capable of processing complex 9-axis MotionFusion algorithms.



DS3231 RTC chip(Real Time Clock Module)

To have an external clock to synchronise time over all components even when the microcontroller is switched off.

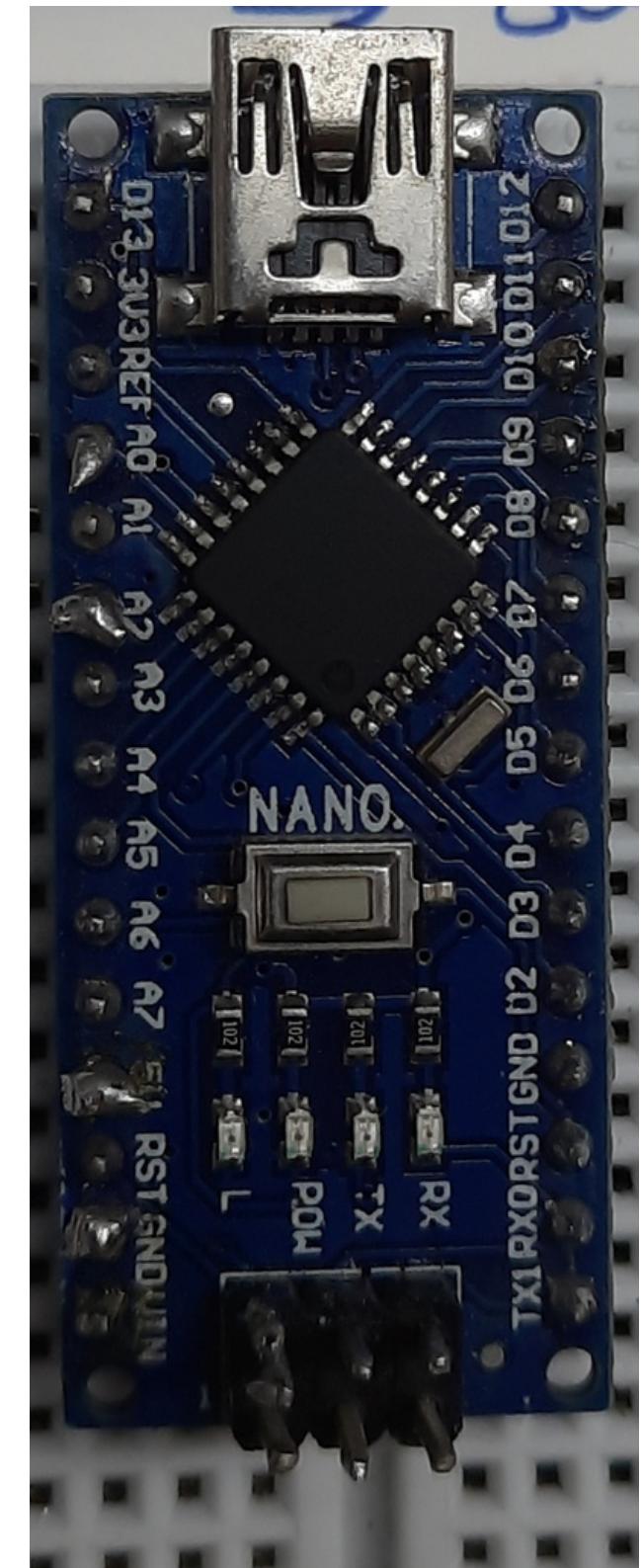
A real-time clock (RTC) is an IC that keeps an updated track of the current time. This information can be read by a microprocessor, usually over a serial interface to facilitate the software performing functions that are time dependent.

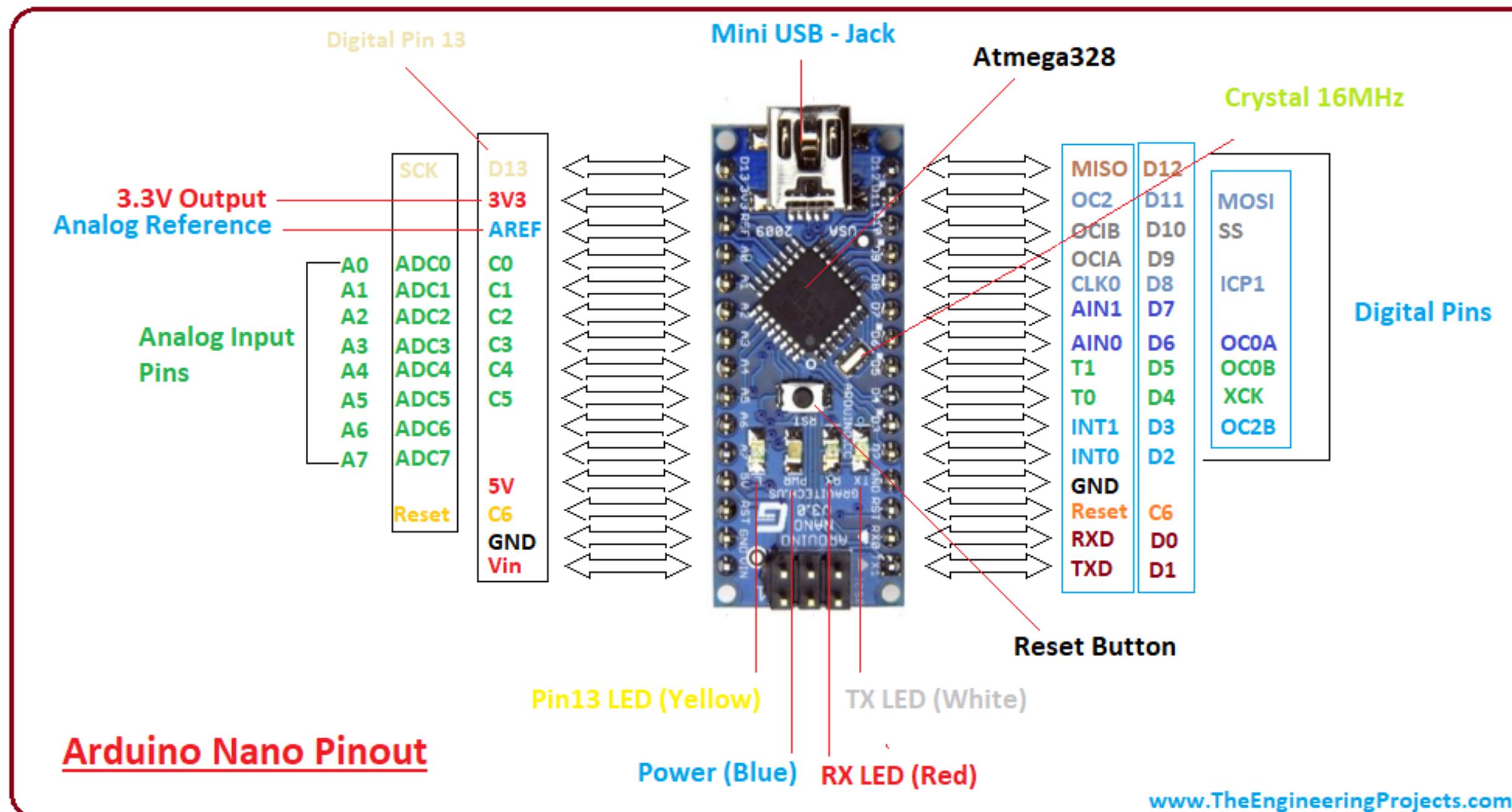


Arduino Nano

A microcontroller used to process data given and give appropriate output.

Arduino Nano is a surface mount breadboard embedded version with integrated USB. It is the smallest, complete, and breadboard-friendly.



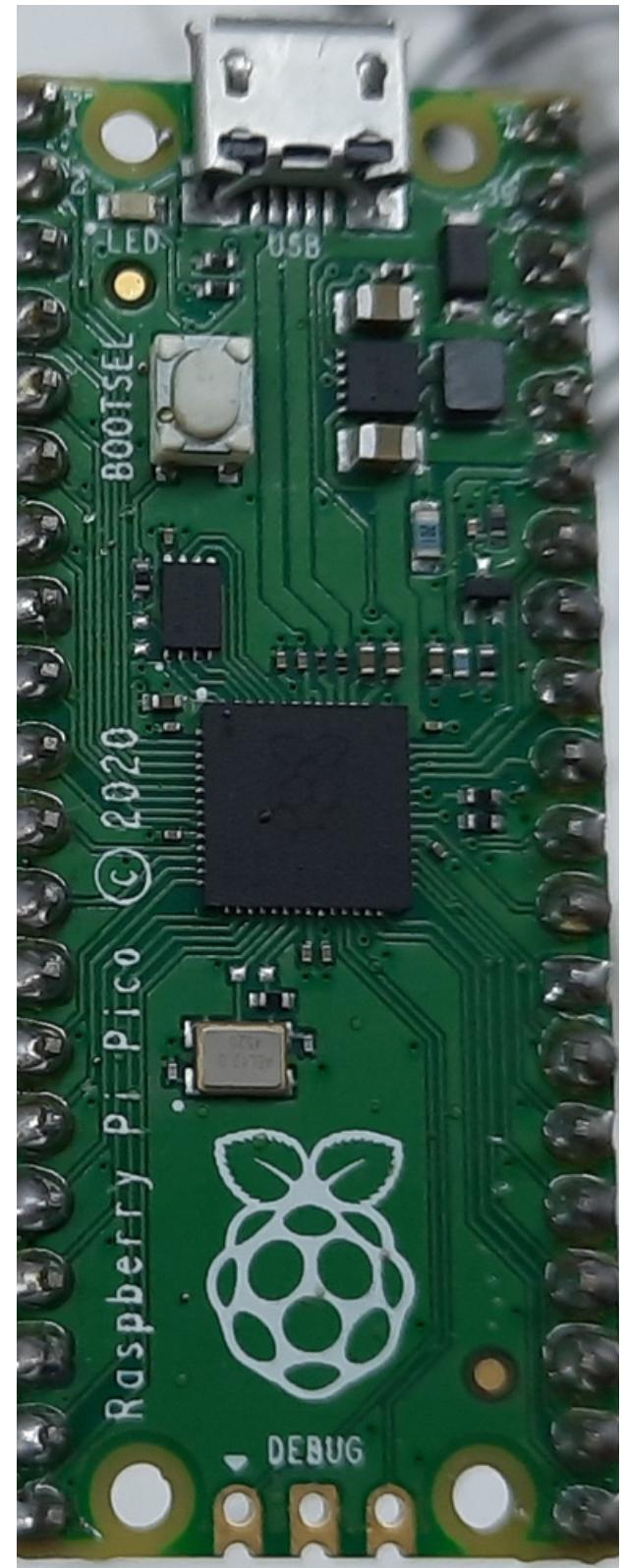


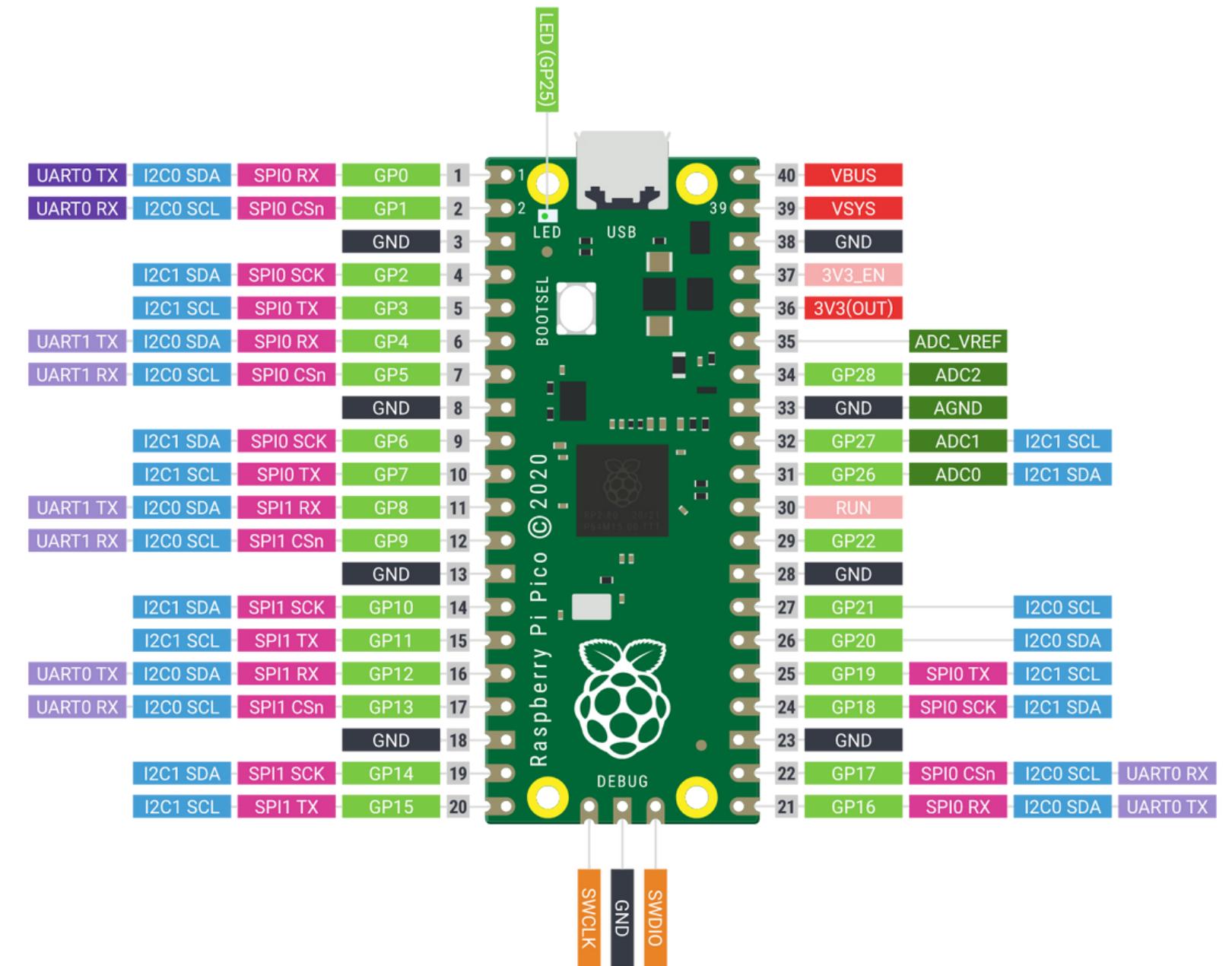
Arduino Nano Pinout Description

Raspberry Pi Pico

A microcontroller used to process data given and give appropriate output.

It is equipped with an RP2040 Microcontroller chip developed by Raspberry Pi Foundation itself. RP2040 is their first dual-core ARM Cortex M0+ processor-based latest small-sized, budget-friendly microcontroller.





Raspberry Pi Pico Pinout Description

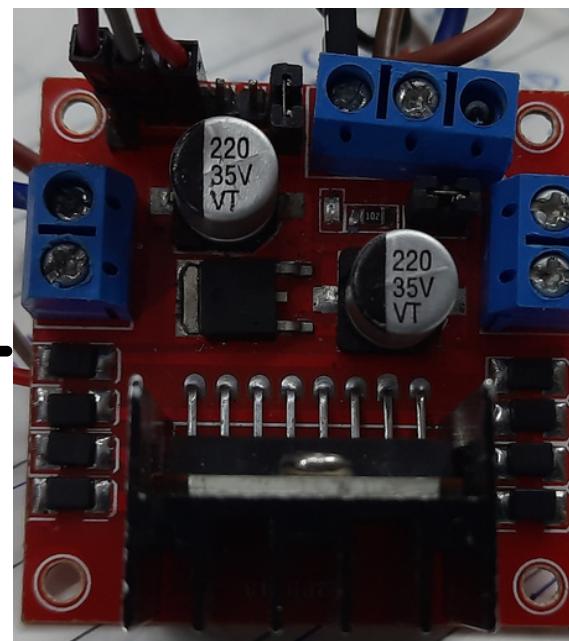
Why Pico over Nano?

- Better Processing Speed(138 MHz Vs 20 MHz)
- More Memory (264 kb Vs 48 kb)
- More Input/Output Devices
(2x UART, 2x SPI, 2xI2C, 16x PWM, 3x Analog
Vs 1x UART, 1x SPI, 1xI2C, 5x PWM, 8x Analog)
- Cheaper(₹349 Vs ₹759)
- Unavailability of Arduino Nano in Semiconductor Market

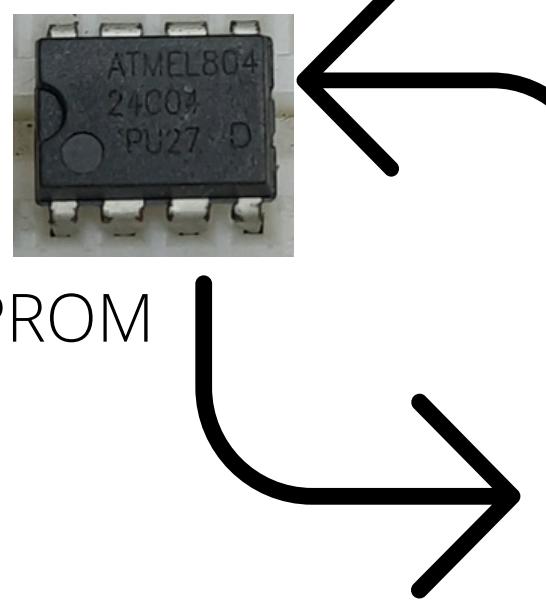
Flowchart of Connections



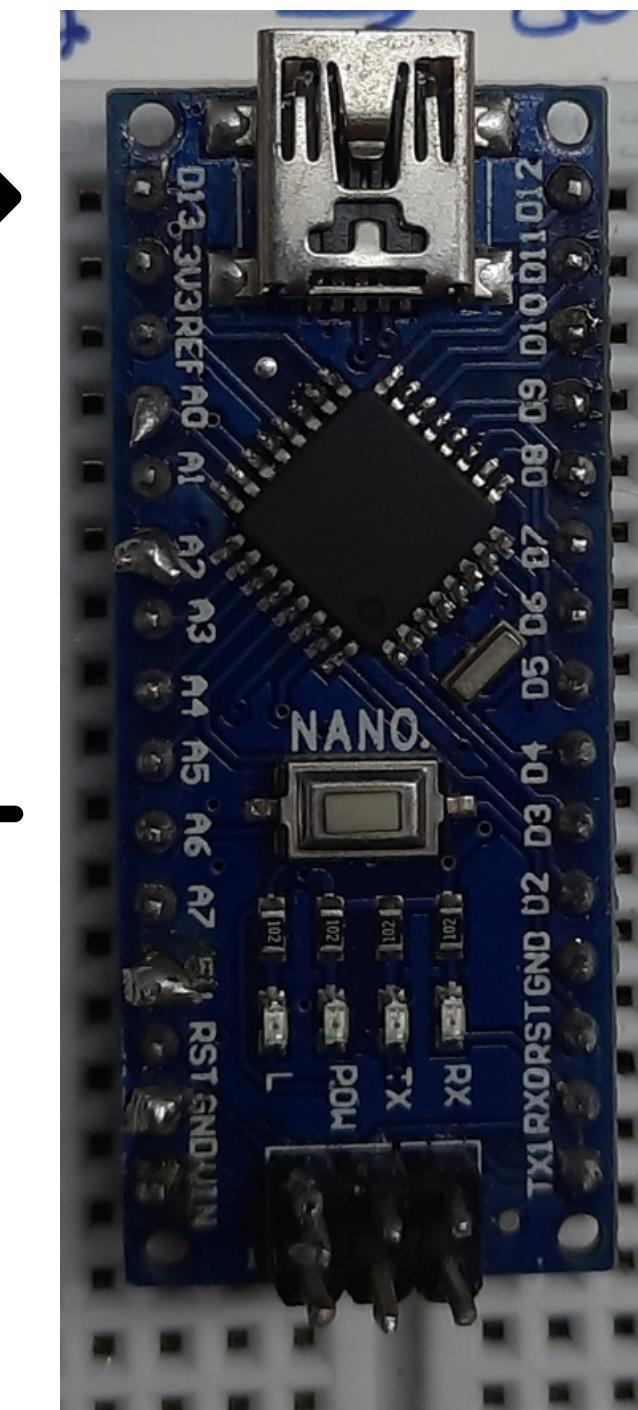
Linear Actuator



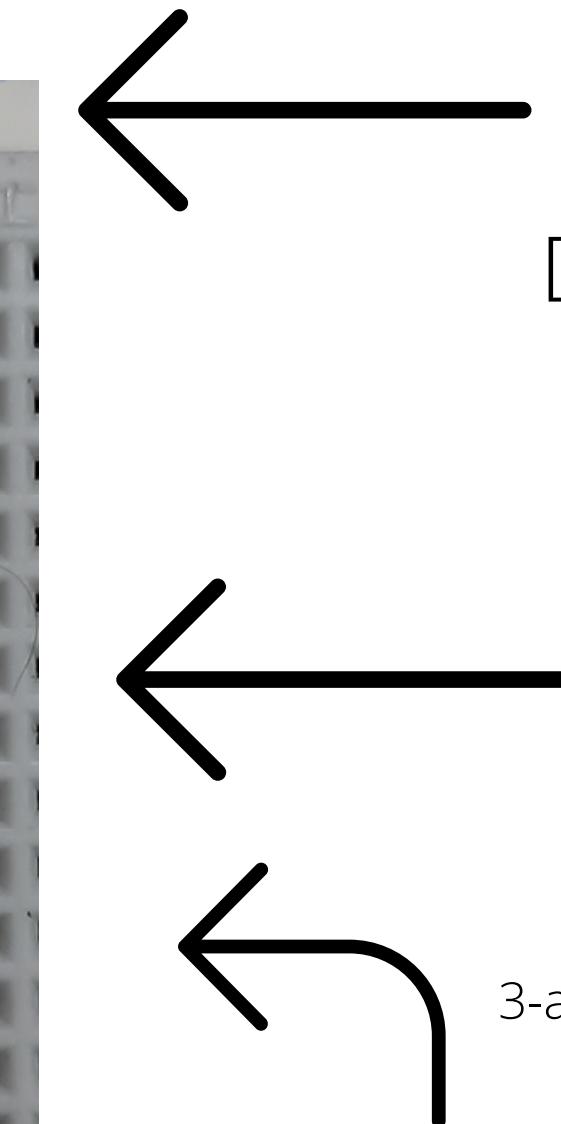
Motor Driver



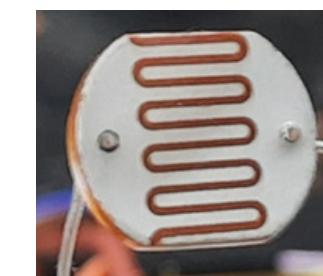
24C04 EEPROM



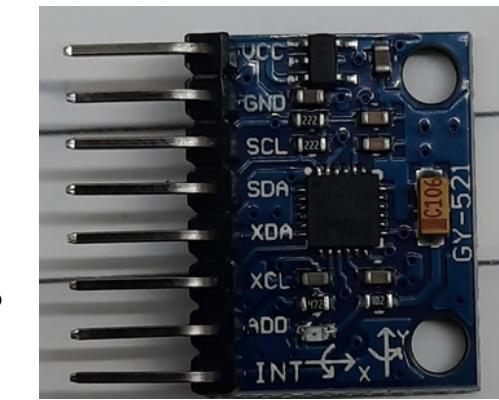
Arduino Nano



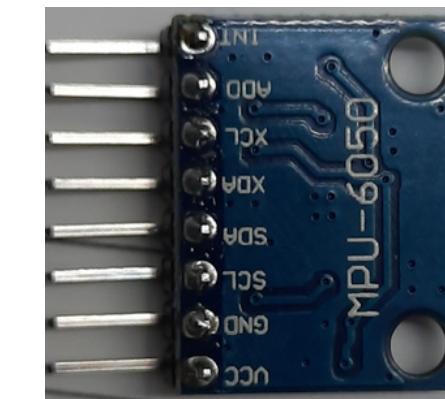
DS3231 RTC chip
Real Time Clock Module



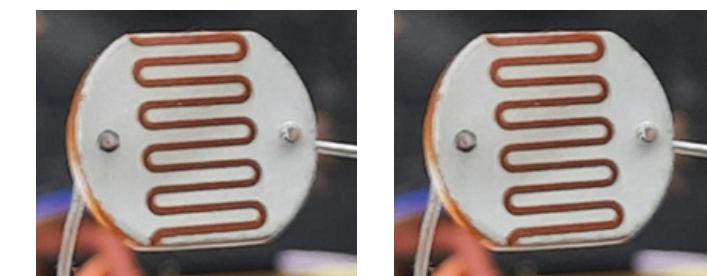
Light Dependent Resistors



DS3231 RTC chip
Real Time Clock Module

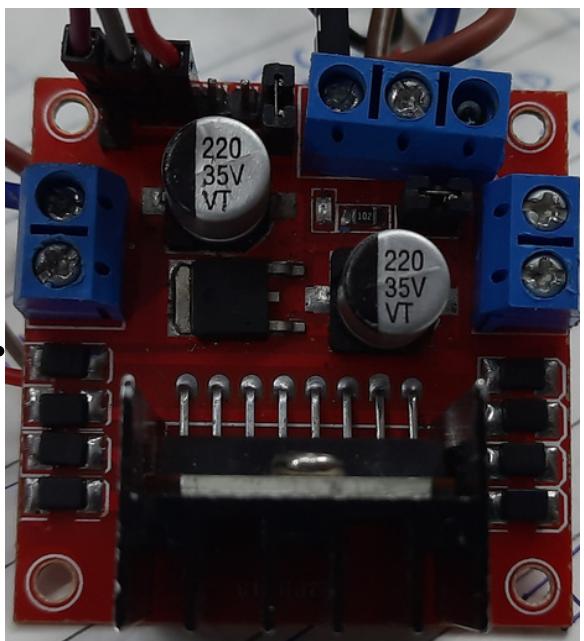


MPU6050 sensor
3-axis Gyroscope and 3-axis Accelerometer

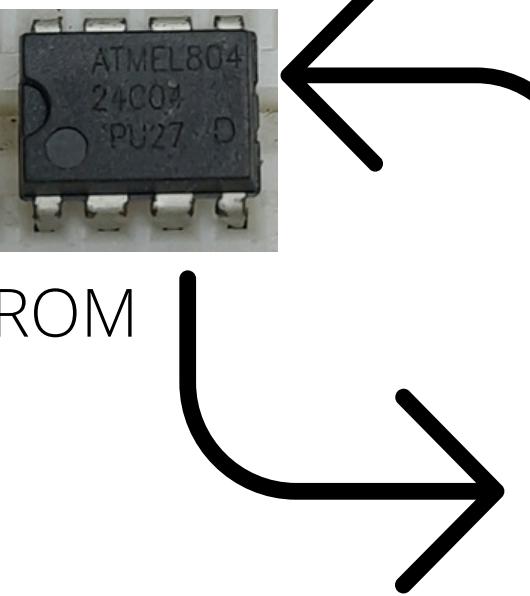




Linear Actuator



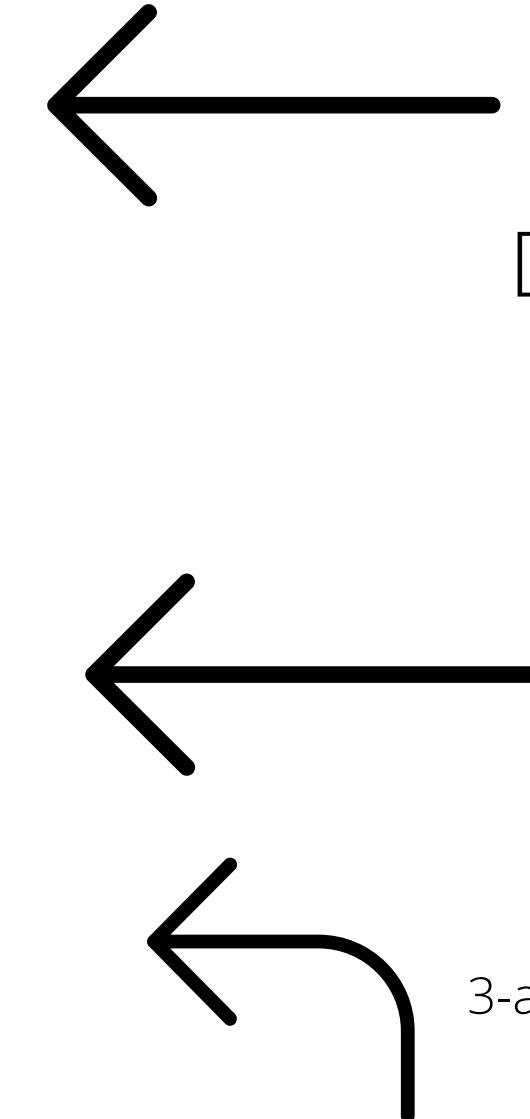
Motor Driver



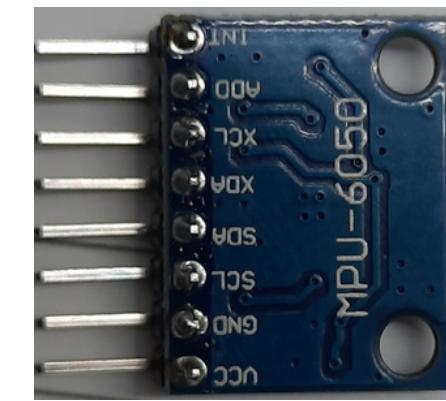
24C04 EEPROM



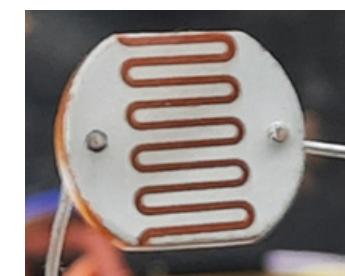
Raspberry Pi Pico



DS3231 RTC chip
Real Time Clock Module



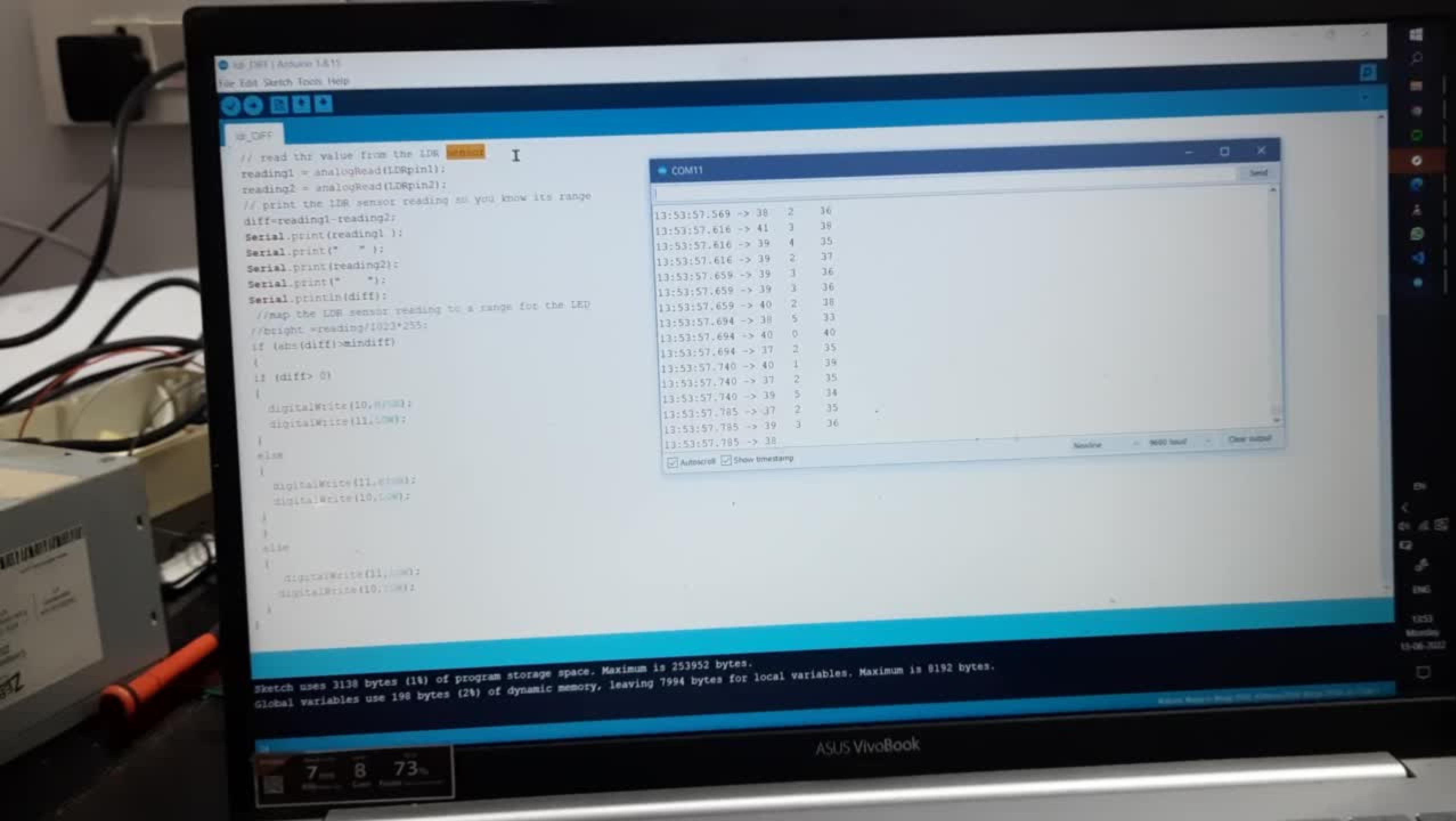
MPU6050 sensor
3-axis Gyroscope and 3-axis Accelerometer



Light Dependent Resistors

Current Status

- We have completed the individual testing of the components for their functions.
- We have integrated the components together to be used with Arduino Nano.
- We have a working model ready.



Post-Midsem Plan

- Incorporate EEPROM.
- Simplify the connections on a PCB board
- Test the Tracker Module in the real environment.
- Work on the problems identified then.

Summary & Conclusion

- Through this process, We got to learn about a variety of electronic components and various libraries related to them.
- We learnt about incorporating components and choosing components, the way it happens in the industry.
- We learnt the whole process through which work is commenced in the R&D department of a company like Prama Instruments Pvt Ltd.

Acknowledgements

Lastly, We would like to thank our PS instructor, Ms Anushaya Mohapatra Ma'am, for the smooth conduct of our Practice School Term.

We would also like to thank Chittaranjan Sir for giving us this Project. We would also like to thank Kalpesh Sir and Shubhangi ma'am for suggesting better ways of getting work done, providing solutions, and being there at every step.

Lastly, I would like to thank all the staff members at Prama who have been so welcoming and helpful.

Thank you.

Documentation:

- github** https://github.com/sakshamssy/PS1_Pramalnstruments

- Google Drive** https://drive.google.com/drive/folders/1XIVC2Eu_QBowvHRhujOVyv8xm8NT41PD?usp=sharing
